



38AE012,014,016

38AKS024

Air-Cooled Condensing Units

50/60 Hz

# Installation, Start-Up and Service Instructions

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## SAFETY CONSIDERATIONS

Installing, starting up, and servicing air-conditioning equipment can be hazardous due to system pressures, electrical components, and equipment location (roofs, elevated structures, etc.).

Only trained, qualified installers and service mechanics should install, start-up, and service this equipment (Fig. 1).

Untrained personnel can perform basic maintenance functions such as cleaning coils. All other operations should be performed by trained service personnel.

When working on the equipment, observe precautions in the literature and on tags, stickers, and labels attached to the equipment.

Follow all safety codes. Wear safety glasses and work gloves. Keep quenching cloth and fire extinguisher nearby when brazing. Use care in handling, rigging and setting bulky equipment.



### ELECTRIC SHOCK HAZARD

Separate power sources (main and control power circuits) are used for these units. Be sure **both** main and control power circuits are disconnected before servicing.

## INSTALLATION

### Step 1 — Complete Pre-Installation Checks

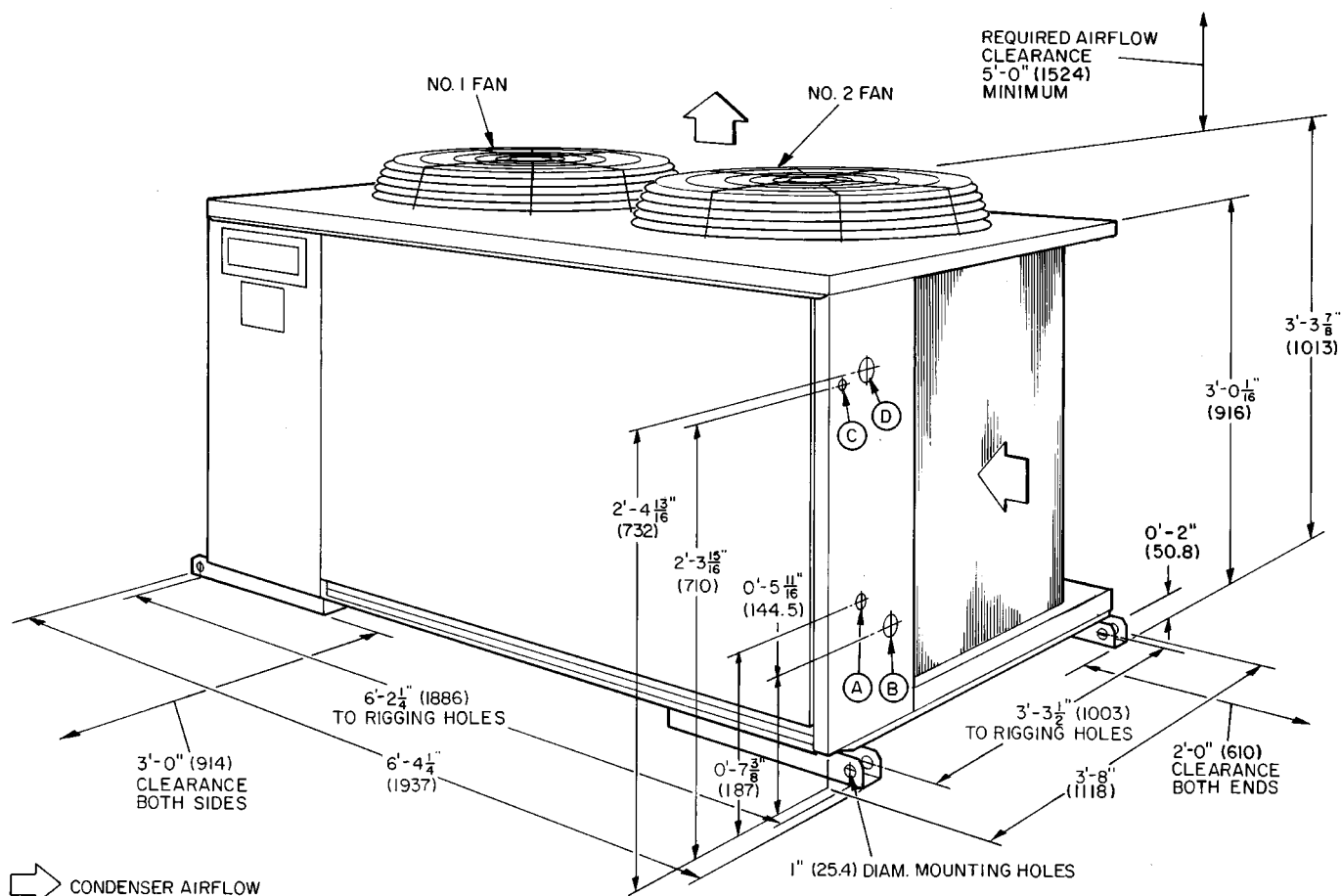
**UNCRATE UNIT** — Remove unit packaging except for the top skid assembly, which should be left in place until after the unit is rigged into its final location.

**INSPECT SHIPMENT** — File claim with shipping company if shipment is damaged or incomplete.

### CONSIDER SYSTEM REQUIREMENTS

- Consult local building codes and National Electrical Code (NEC, U.S.A.) for special installation requirements.
- Allow sufficient space for airflow clearance, wiring, refrigerant piping, and servicing unit. See Fig. 1. See Fig. 2 for unit component locations.
- Locate unit so that outdoor coil (condenser) airflow is unrestricted on all sides and above.
- Unit may be mounted on a level pad directly on the base channels or mounted on raised pads at support points. See Table 1A-1D for unit operating weights. See Table 2 for weight distribution based on recommended support points.

**NOTE:** If vibration isolators are required for a particular installation, use the data in Table 2 to make the proper selection.



➡ CONDENSER AIRFLOW

#### LEGEND

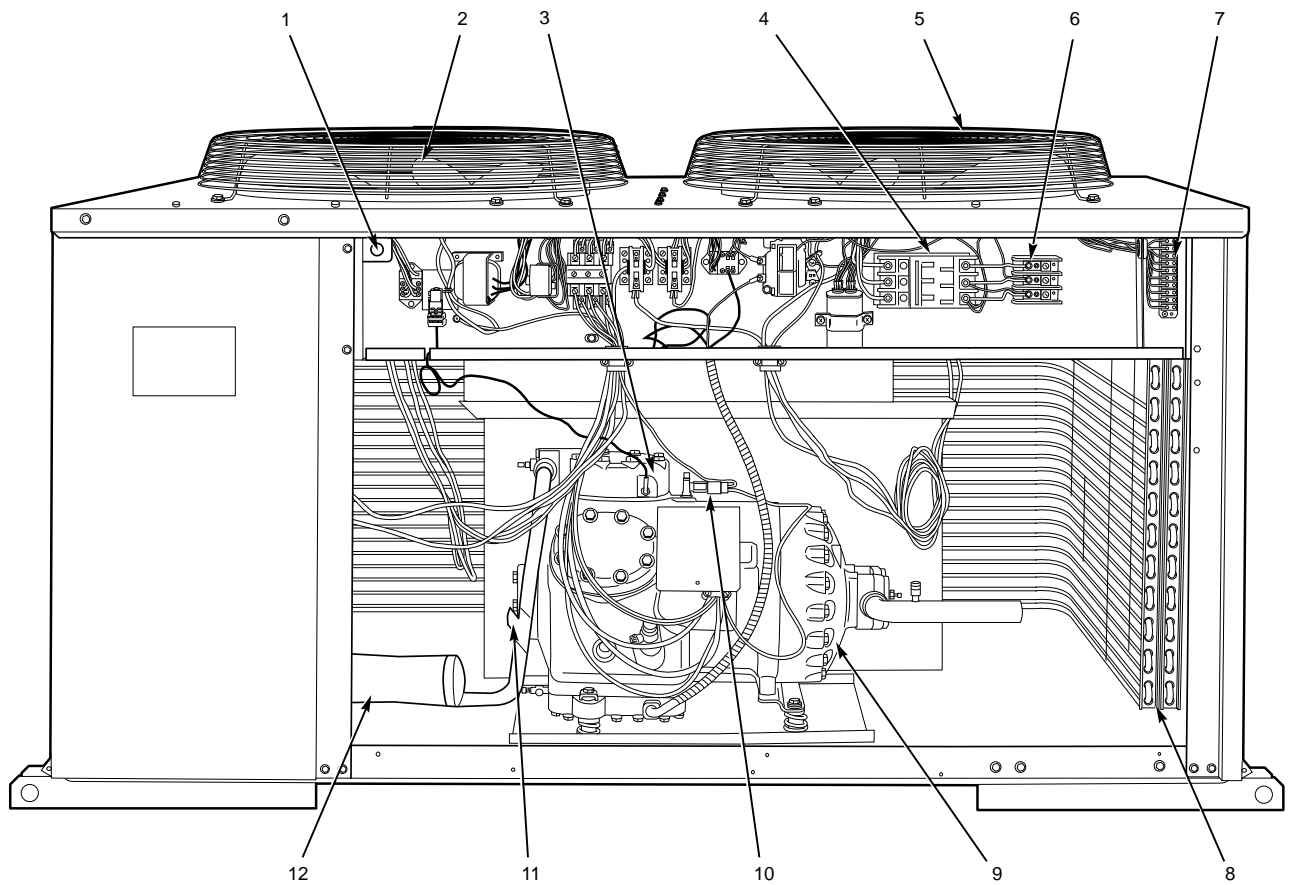
- A — 1 1/4-in. (32) diameter knockout for 5/8-in. (16) ODM liquid line connection
- B — 1 3/4-in. (44.5) diameter knockout for suction line connections of 1 1/8 in. (28.6) (38AE012), 1 3/8 in. (35) (38AE014,016), 1 1/2 in. (41) (38AKS024)
- C — 7/8-in. (22.2) diameter knockout for control power
- D — 2-in. (50.8) diameter knockout for unit power

#### NOTES:

1. SERVICE AREAS — Allow 3 ft (914) on both sides and 2 ft (610) on both ends of unit for servicing.
2. Dimensions in ( ) are in millimeters.

Certified dimension drawings are available on request.

**Fig. 1 — Dimensions (ft-in.)**



#### LEGEND

- |                          |                                      |   |
|--------------------------|--------------------------------------|---|
| 1 — Low-Voltage Fuse     | 5 — No. 2 Fan                        | 9 — Compressor                                |
| 2 — No. 1 Fan            | 6 — Terminal Block 1 (Unit Power)    | 10 — Low-Pressure Switch                      |
| 3 — High-Pressure Switch | 7 — Terminal Block 2 (Control Power) | 11 — Hot Gas Bypass Piping Stub (3/8-in. ODM) |
| 4 — Circuit Breakers     | 8 — Wraparound Coil                  | 12 — Muffler                                  |

**Fig. 2 — Component Locations (Typical — 38AE Shown)**

**Table 1A — Physical Data (English, 60 Hz)**

UNIT	38AE012	38AE014	38AE016	38AKS024
OPERATING WEIGHT (lb)	732	779	789	900
REFRIGERANT*	R-22			
COMPRESSOR	Reciprocating, Semi-Hermetic			
Speed (Rpm)	1750			
No. Cylinders	6	6	6	4
Model No.	06DD824	06DD328	06DD537	06E4250
Oil (pt)	10	10	10	15.5
Crankcase Heater Watts	125	125	125	180
Unloader Setting (psig)				
Load	70 ± 1			
Unload	60 ± 2			
OUTDOOR-AIR FANS	Axial Flow, Direct Drive			
No. ...Rpm	2...1075			
Diameter (in.)	24	24	24	26
Motor Hp	1/2			
Nominal Total Airflow (Cfm)	8800	8800	8800	11,000
OUTDOOR COIL				
Face Area (sq ft)	29.2			
Storage Capacity (lb)†	27.2	40.3	39.8	39.8
CONTROLS				
Pressurestat Settings (psig)				
High Cutout	395 ± 10			
Cut-in	295 ± 10			
Low Cutout	29 ± 4			
Cut-in.	60 +15, -0			
FUSIBLE PLUG (F)	200			
PIPING CONNECTIONS (in. ODM)				
Suction	1 1/8	1 3/8	1 3/8	1 5/8
Liquid	5/8			

Unit is factory supplied with holding charge only.

†Storage capacity is measured at liquid saturated temperatures of 125 F for 38AE012, 123 F for 38AE014, and 130 F for 38AE016 and 38AKS024.

**Table 1B — Physical Data (SI, 60 Hz)**

UNIT	38AE012	38AE014	38AE016	38AKS024
OPERATING WEIGHT (kg)	333	354	359	408
REFRIGERANT*	R-22			
COMPRESSOR	Reciprocating, Semi-Hermetic			
Speed (r/s)	29.2			
No. Cylinders	6	6	6	4
Model No.	06DD824	06DD328	06DD537	06E4250
Oil (L)	4.73	4.73	4.73	7.33
Crankcase Heater Watts	125	125	125	180
Unloader Setting (kPa)				
Load	483 ± 6.9			
Unload	414 + 103, -0			
OUTDOOR-AIR FANS	Axial Flow, Direct Drive			
No. ...r/s	2...17.9			
Diameter (mm)	610	610	610	661
Motor Hp	1/2			
Nominal Total Airflow (L/s)	4153	4153	4153	5566
OUTDOOR COIL				
Face Area (sq m)	2.71			
Storage Capacity (kg)†	12.4	18.3	18.1	18.1
CONTROLS				
Pressurestat Settings (kPa)				
High Cutout	2724 ± 68.9			
Cut-in	2034 ± 68.9			
Low Cutout	200 ± 27.6			
Cut-in	414 + 103, -0			
FUSIBLE PLUG (C)	93.3			
PIPING CONNECTIONS (in. ODM)				
Suction	1 1/8	1 3/8	1 3/8	1 5/8
Liquid	5/8			

\*Unit is factory supplied with holding charge only.

†Storage capacity is measured at liquid saturated temperatures of 51.7 C for 38AE012, 50.6 C for 38AE014, and 54.4 C for 38AE016 and 38AKS024.

**Table 1C — Physical Data (English, 50 Hz)**

UNIT	38AE012	38AE014	38AE016	38AKS024
OPERATING WEIGHT (lb)	732	779	789	900
REFRIGERANT*	R-22			
COMPRESSOR	Reciprocating, Semi-Hermetic			
Speed (Rpm)	1460			
No. Cylinders	6	6	6	4
Model No.	06DD824	06DD328	06DD537	06E4250
Oil (pt)	10	10	10	15.5
Crankcase Heater Watts	125	125	125	180
Unloader Setting (psig)				
Load	70 ± 1			
Unload	60 ± 2			
OUTDOOR-AIR FANS	Axial Flow, Direct Drive			
No. ...Rpm	2...900			
Diameter (in.)	24	24	24	26
Motor Hp			1/2	
Nominal Total Airflow (Cfm)	7368	7368	7368	9210
OUTDOOR COIL				
Face Area (sq ft)		29.2		
Storage Capacity (lb)†	27.2	40.3	39.8	39.8
CONTROLS				
Pressurestat Settings (psig)				
High Cutout	395 ± 10			
Cut-in	295 ± 10			
Low Cutout	29 ± 4			
Cut-in	60 + 15, -0			
FUSIBLE PLUG (F)	200			
PIPING CONNECTIONS (in. ODM)				
Suction	1 1/8	1 3/8	1 3/8	1 5/8
Liquid			5/8	

\*Unit is factory supplied with holding charge only.

†Storage capacity is measured at liquid saturated temperatures of 125 F for 38AE012, 123 F for 38AE014, and 130 F for 38AE016 and 38AKS024.

**Table 1D — Physical Data (SI, 50 Hz)**

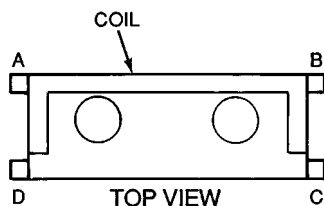
UNIT	38AE012	38AE014	38AE016	38AKS024
OPERATING WEIGHT (kg)	333	354	359	408
REFRIGERANT*	R-22			
COMPRESSOR	Reciprocating, Semi-Hermetic			
Speed (r/s)	24.3			
No. Cylinders	6	6	6	4
Model No.	06DD824	06DD328	06DD537	06E4250
Oil (L)	4.73	4.73	4.73	7.33
Crankcase Heater Watts	125	125	125	180
Unloader Setting (kPa)				
Load	483 ± 6.9			
Unload	414 + 103, -0			
OUTDOOR-AIR FANS	Axial Flow, Direct Drive			
No. ...r/s	2...15.0			
Diameter (mm)	610	610	610	661
Motor Hp			1/2	
Nominal Total Airflow (L/s)	3728	3728	3728	4660
OUTDOOR COIL				
Face Area (sq m)		2.71		
Storage Capacity (kg)†	12.4	18.3	18.1	18.1
CONTROLS				
Pressurestat Settings (kPa)				
High Cutout	2724 ± 68.9			
Cut-in	2034 ± 68.9			
Low Cutout	200 ± 27.6			
Cut-in	414 + 103, -0			
FUSIBLE PLUG (C)	93.3			
PIPING CONNECTIONS (in. ODM)				
Suction	1 1/8	1 3/8	1 3/8	1 5/8
Liquid			5/8	

\*Unit is factory supplied with holding charge only.

†Storage capacity is measured at liquid saturated temperatures of 51.7 C for 38AE012, 50.6 C for 38AE014, and 54.4 C for 38AE016 and 38AKS024.

**Table 2 — Weight Distribution**

UNIT	WEIGHT — lb (kg)				
	Total Operating	Support Point			
		A	B	C	D
38AE012	732 (333)	142 (65)	138 (63)	225 (102)	227(103)
38AE014	779 (354)	143 (65)	140 (64)	247 (112)	249 (113)
38AE016	789 (359)	143 (65)	143 (65)	250 (114)	253 (115)
38AKS024	900 (408)	178 (81)	168 (76)	269 (122)	285 (129)



## Step 2 — Rig and Mount the Unit

### ⚠ CAUTION

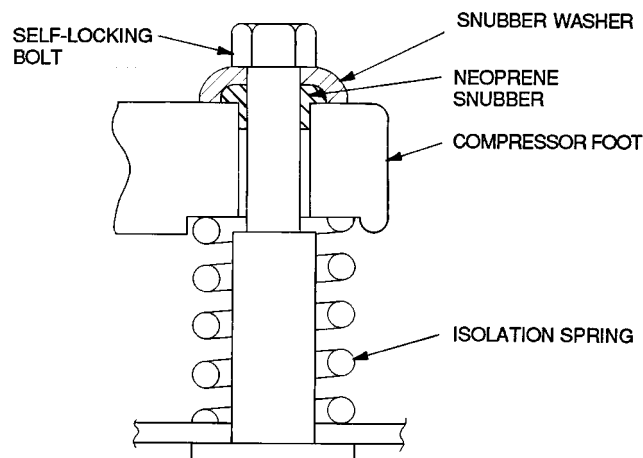
Be sure unit panels are securely in place prior to rigging.

**RIGGING** — These units are designed for overhead rigging only. For this purpose, the transverse base channels extend beyond the sides of the unit, with holes provided in the end plates to attach cables or hooks. Rig with top skid packaging assembly in place to prevent unit damage by the rigging cable. As further protection for the coil faces, plywood sheets can be placed against the sides of the unit, behind the cables. Run the cables to a central suspension point so that the angle from the horizontal is not less than 45 degrees. Raise and set the unit down carefully.

If it is necessary to roll the unit into position, mount the unit on longitudinal rails, using a minimum of 3 rollers. Apply force to the rails, not the unit. If the unit is to be skidded into position, place it on a large pad and drag it by the pad. Do not apply any force to the unit.

Raise from above to lift unit from the rails or pad when unit is in final position.

**COMPRESSOR MOUNTING** — As shipped, the compressor is held tightly in place by self-locking bolts. **Before starting unit, loosen self-locking bolts until the snubber washer can be moved sideways with finger pressure. Do not remove shipping bolts. See Fig. 3.**



**Fig. 3 — Compressor Mounting**

## Step 3 — Complete Refrigerant Piping Connections

**IMPORTANT:** A refrigerant receiver is not provided with the unit. Do not install a receiver.

**SIZE REFRIGERANT LINES** — Consider the length of piping required between outdoor unit and indoor unit (evaporator), the amount of liquid lift, and compressor oil return. See Tables 3, 4A, and 4B and also refer to Part 3 of Carrier System Design Manual for design details and line sizing. Refer to indoor installation instructions for additional information.

**Table 3 — Liquid Line Data**

UNIT	MAXIMUM ALLOWABLE LIQUID LIFT ft (m)		LIQUID LINE		
	60 Hz	50 Hz	Maximum Allowable Pressure Drop psig (kPa)	Maximum Allowable Temp. Loss F (C)	Filter Drier and Sight Glass Flare Conn.* in. (mm)
38AE012	52 (15.8)		7 (48.3)	2 (1.1)	5/8
38AE014	67 (20.4)				
38AE016	82 (25)				
38AKS024	87 (26.5)	86 (26)			

\*Inlet and outlet.

NOTE: Data shown is for units operating at 45 F (7.2 C) saturated suction and 95 F (35 C) entering air.

**Table 4A — Refrigerant Piping Sizes — 60 Hz**

UNIT	LENGTH OF INTERCONNECTING PIPING — FT (M)									
	0-15 (0-4.6)		15-25 (4.6-7.6)		25-50 (7.6-15.2)		50-75 (15.2-22.9)		75-100 (22.9-30.5)	
	Line Size — in. OD									
	L	S	L	S	L	S	L	S	L	S
38AE012	½	1⅛	½	1⅛	⅝	1⅜	⅝	1⅜	⅝	1⅝
38AE014	½	1⅛	½	1⅜	⅝	1⅜	⅝	1⅜	⅝	1⅝
38AE016	½	1⅜	⅝	1⅜	⅝	1⅝	⅞	1⅞	⅞	2⅛
38AKS024	⅝	1⅝	⅝	1⅝	⅞	1⅞	⅞	2⅛	⅞	2⅛

### LEGEND

L — Liquid  
S — Suction

Close coupled.

### NOTES:

- Pipe sizes are based on a 2 F (1.1 C) loss for liquid lines and a 1.5 F (0.8 C) loss for suction lines.
- Pipe sizes are based on an equivalent length equal to the maximum length of interconnecting piping plus 50% for fittings. A more accurate estimate may result in smaller sizes.

**Table 4B — Refrigerant Piping Sizes — 50 Hz**

UNIT	LENGTH OF INTERCONNECTING PIPING — FT (M)									
	0-15 (0-4.6)		15-25 (4.6-7.6)		25-50 (7.6-15.2)		50-75 (15.2-22.9)		75-100 (22.9-30.5)	
	Line Size — in. OD									
	L	S	L	S	L	S	L	S	L	S
38AE012	½	1⅛	½	1⅛	⅝	1⅞	⅝	1⅜	⅝	1⅜
38AE014	½	1⅛	½	1⅛	⅝	1⅜	⅝	1⅜	⅝	1⅜
38AE016	½	1⅜	⅝	1⅜	⅝	1⅜	⅝	1⅜	⅝	1⅝
38AKS024	⅝	1⅝	⅝	1⅝	⅝	1⅝	⅞	1⅝	⅞	1⅝

### LEGEND

L — Liquid  
S — Suction

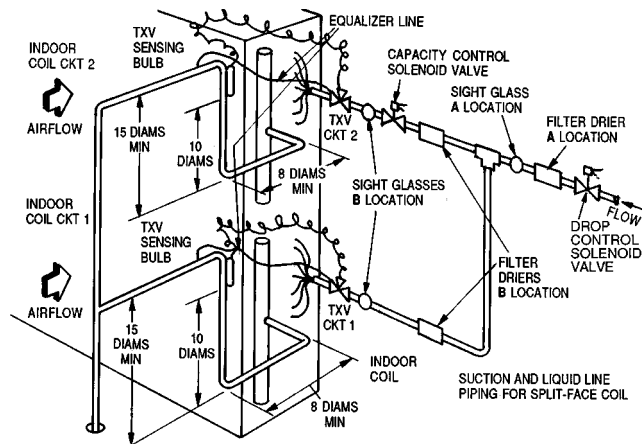
Close coupled.

### NOTES:

- Pipe sizes are based on a 2 F (1.1 C) loss for liquid lines and a 1.5 F (0.8 C) loss for suction lines.
- Pipe sizes are based on an equivalent length equal to the maximum length of interconnecting piping plus 50% for fittings. A more accurate estimate may result in smaller sizes.

**INSTALL FILTER DRIER(S) AND MOISTURE INDICATOR(S)** — Every unit should have a filter drier and liquid-moisture indicator (sight glass). In some applications, depending on space and convenience requirements, it may be desirable to install 2 filter driers and sight glasses. One filter drier and sight glass may be installed at **A** locations in Fig. 4. Or, 2 filter driers and sight glasses may be installed at **B** locations.

Select the filter drier for maximum unit capacity and minimum pressure drop. Complete the refrigerant piping from indoor unit to outdoor unit before opening the liquid and suction lines at the outdoor unit.



TXV — Thermal Expansion Valve

**Fig. 4 — Location of Sight Glass(es) and Filter Drier(s)**

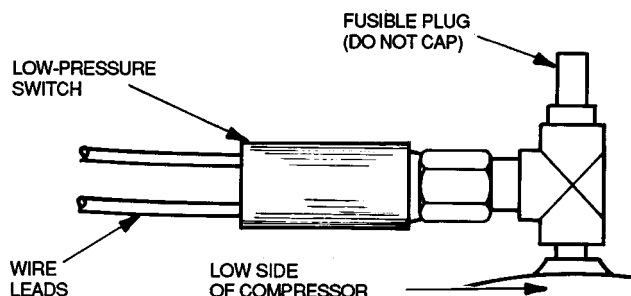
**INSTALL LIQUID LINE SOLENOID VALVE — SOLENOID DROP** — It is recommended that a solenoid valve be placed in the main liquid line (see Fig. 4) between condensing unit (38AE/AKS) and fan coil (40RR, 40RE). (A liquid line solenoid valve is required when the liquid line length exceeds 100 ft [30.5 m] or when the condensing unit is connected to the chiller barrel in a built-up chiller system.) This valve prevents refrigerant migration (which causes oil dilution) to the compressor during the off cycle at low outdoor ambient temperatures. The solenoid should be wired in parallel with the compressor contactor coil. This means of electrical control is referred to as solenoid *drop* control.

**INSTALL LIQUID LINE SOLENOID VALVE (OPTIONAL) — CAPACITY CONTROL** — If 2-step cooling is desired, place a solenoid valve in the location shown in Fig. 4.

**MAKE PIPING CONNECTIONS** — Do not remove run-around loop from suction and liquid line stubs in the compressor compartment until piping connections are ready to be made. Pass nitrogen or other inert gas through piping while brazing to prevent formation of copper oxide.

Install field-supplied thermostatic expansion valve(s) in indoor section. If 2 thermostatic expansion valves are installed for 2-step cooling, install field-supplied liquid line solenoid valve ahead of the second expansion valve.

**PROVIDE SAFETY RELIEF** — A fusible plug is located on the compressor crankcase or in the liquid line (Fig. 5). Do not cap this plug. If local code requires additional safety devices, install them as directed.



NOTE: 38AKS024 has a fusible plug in the liquid line.

**Fig. 5 — Location of Fusible Plug (38AE)**

**Step 4 — Install Accessories** — Field install accessories such as winter start control or low-ambient control before proceeding with wiring. Refer to the instructions shipped with the accessory.

### Step 5 — Complete Electrical Connections

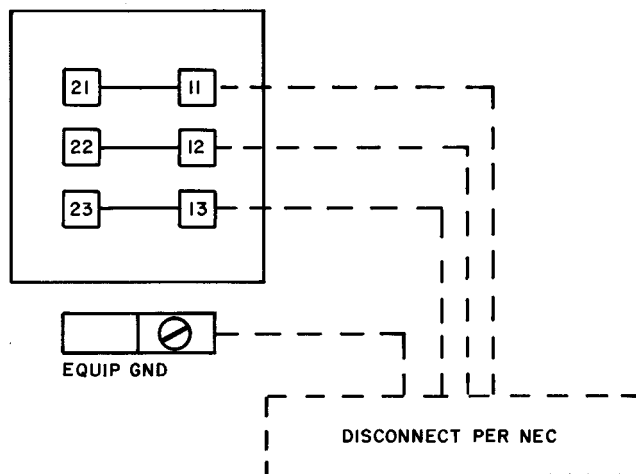
**POWER WIRING** — Unit is factory wired for voltage shown on nameplate. Provide adequate fused disconnect switch within sight from unit and readily accessible from unit, but out of the reach of children. Lock switch open (off) to prevent power from being turned on while unit is being serviced. Disconnect switch, fuses, and field wiring must comply with national and local code requirements. See Tables 5A and 5B.

Route power wires through opening in unit end panel to connection in unit control box as shown on unit label diagram and in Fig. 6. Unit must be grounded.

Affix crankcase heater warning sticker to unit disconnect switch.

**CONTROL CIRCUIT WIRING** — Control voltage is 24 v. See Fig. 7 and unit label diagram for field-supplied wiring details. Route control wires through opening in unit end panel to connection in unit control box.

### TERMINAL BOARD (TB1) IN UNIT CONTROL BOX



#### LEGEND

- EQUIP GND** — Equipment Ground
- NEC** — National Electrical Code
- Factory Wiring
- - - - - Field Wiring

**Fig. 6 — Main Power Supply Wiring**





## PRE-START-UP

**Evacuate and Dehydrate** the entire refrigerant system by either of the methods described in Carrier Standard Service Techniques Manual, Chapter 1.

**Leak Test** the entire refrigerant system by the pressure method described in Carrier Standard Service Techniques Manual, Chapter 1. Use R-22 at approximately 25 psig (172.4 kPa) backed up with an inert gas to a total pressure not to exceed 245 psig (1689 kPa).

**Turn on Crankcase Heaters** for 24 hours before starting the unit to be sure all the refrigerant is out of the oil. To energize the crankcase heaters, proceed as follows.

1. Set the space thermostat set point above the space temperature so there is no demand for cooling.
2. Close the field disconnect.
3. Turn the fan circuit breaker on. Leave the compressor circuit breakers off. The crankcase heaters are now energized.

**Add Preliminary Charge** to the refrigerant system accordingly to Carrier Standard Service Techniques Manual, Chapter 1. By the liquid charging method and charging by weight procedure, charge the units with approximately the amounts of R-22 refrigerant shown in Table 6.

**Table 6 — Charging Data (R-22)**

UNIT	REFRIGERANT CHARGE - lb (kg)		CONDENSING TEMP DURING CHARGING - F (C)
	Required Charge Above Clear Sight Glass	Outdoor Unit Total Charge (Approx)	
38AE012	3.0 (1.4)	22 (10)	125 (51.7)
38AE014	4.8 (2.2)	23 (10.5)	123 (50.6)
38AE016	3.4 (1.5)	23 (10.5)	130 (54.4)
38AKS024	3.4 (1.5)	28 (12.7)	131 (54.8)

**Before Starting Unit** ensure the following:

1. Compressor oil level must be at least within sight in the compressor sight glass. Add oil if necessary (see Tables 1A-1D and Oil Charge section).
2. Compressor holddown bolts must be snug, but not tight. Refer to Compressor Mounting section and tag on compressor foot.
3. All internal wiring connections must be tight; all barriers and covers must be in place.
4. Electrical power source must agree with unit nameplate rating.
5. All service valves must be open.
6. Crankcase heater must be firmly locked into the compressor crankcase.

## START-UP

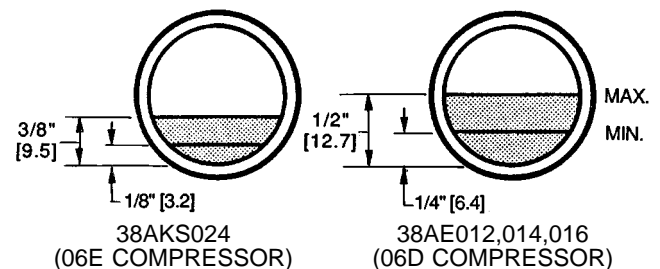
**To Start Unit** — Set thermostat set point below the space temperature. After starting unit, there is a delay of at least 3 seconds before compressor starts.

**Oil Charge** (see Tables 1A-1D) — Allow unit to run for about 20 minutes. Stop unit and check compressor oil level at sight glass. Add oil if necessary to bring oil to the correct level shown in Fig. 8. Use only Carrier-approved compressor oil. Approved oils are:

Witco Chemical Corp. . . . . Suniso 3GS  
 Texaco, Inc. . . . . WF32  
 Petroleum Specialties Co. . . . . Cryol 150

Do not reuse drained oil or use any oil that has been exposed to atmosphere. Procedures for adding or removing oil are given in Carrier Standard Service Techniques Manual, Chapter 1, Refrigerants.

If oil is added, run unit for additional 10 minutes. Stop unit and check oil level. If level is still low, add oil only after determining that piping system is designed for proper oil return and that the system is not leaking oil.



**Fig. 8 — Operating Oil Levels**

**Refrigerant Charge** — Actual start-up should be done only under supervision of a qualified refrigeration mechanic. Refer to charging charts.

See Fig. 9-11 for the particular unit being charged. Measure pressure at the liquid line service valve, being sure a Schrader depressor is used if required. Also, measure liquid line temperature as close to the liquid service valve as possible. Add or reduce charge until the pressure and temperature conditions of the charging charge curve are met. If liquid pressure and temperature point falls above curve, add charge. If liquid pressure and temperature point falls below curve, reduce the charge until the conditions match the curve.

### ⚠ CAUTION

Never charge liquid into the low-pressure side of system. Do not overcharge. During charging or removal of refrigerant, be sure indoor fan system is operating.

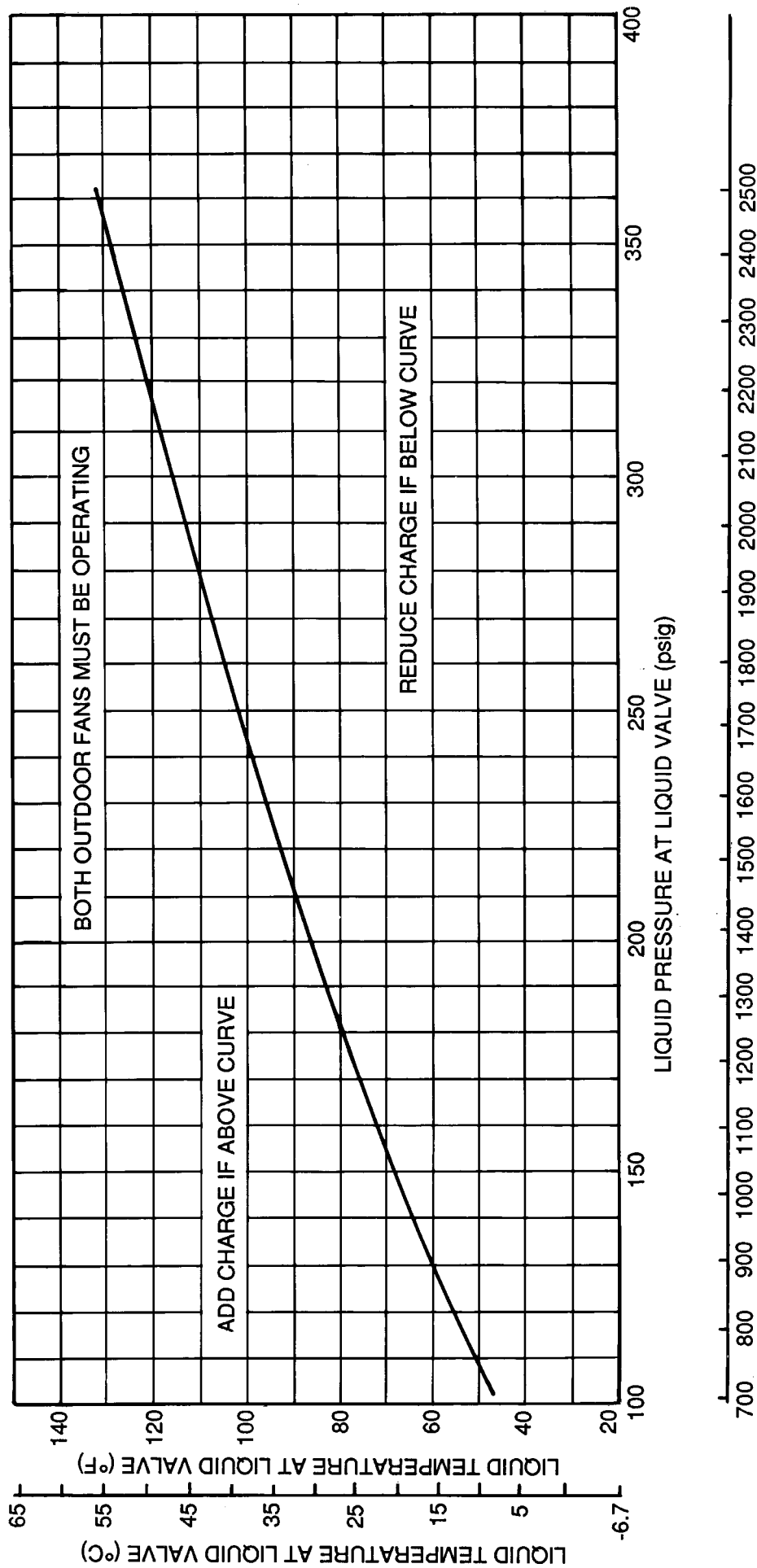


Fig. 9 — 38AE012 and 38AKS024 Charging Chart

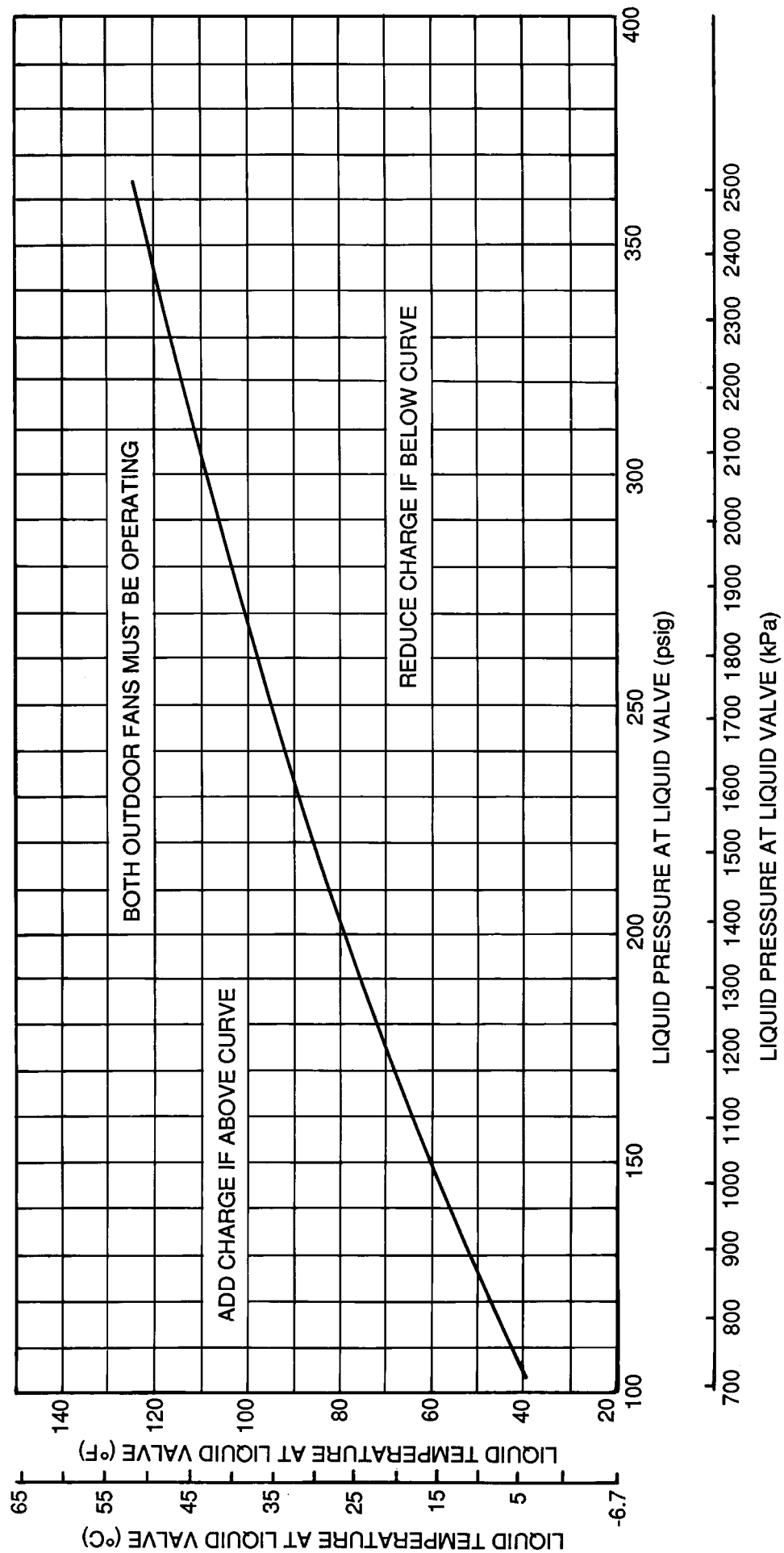


Fig. 10 — 38AE014 Charging Chart

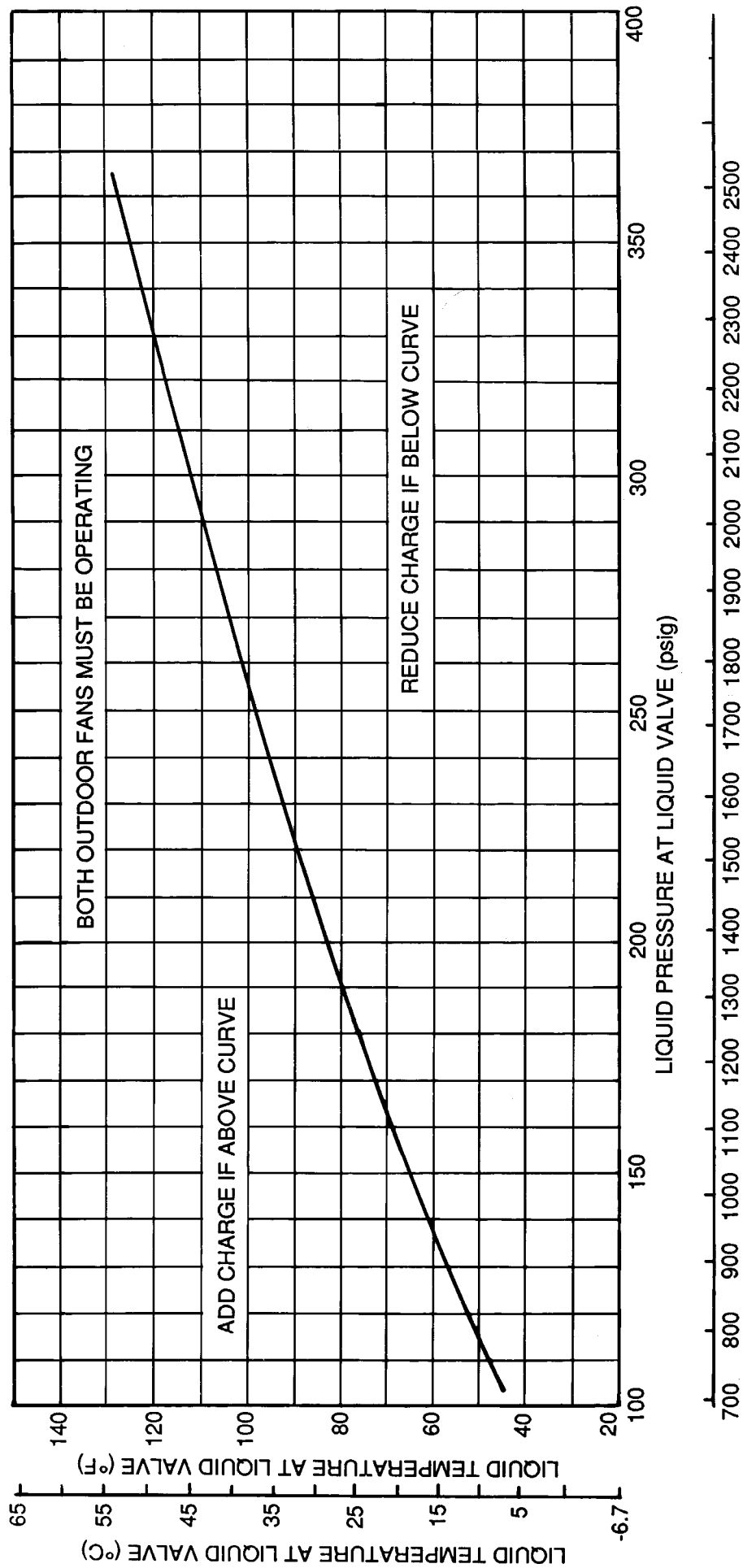


Fig. 11 — 38AE016 Charging Chart

**Check Operation** — Verify operation of all safety controls. Replace all service panels. *Be sure that control panel cover is closed tightly.*

## OPERATING SEQUENCE

**Cooling** — When the first stage (TC1) of the cooling thermostat closes, the timer starts. After approximately 3 seconds, the timer activates the compressor and fan motor no. 1 contactor. When the liquid pressure builds to approximately 257 psig (1772 kPa), fan motor no. 2 is energized.

On demand for additional cooling capacity, the second stage (TC2) of the cooling thermostat closes, energizing a field-supplied liquid line solenoid (LLS) valve, which opens. This increases the suction pressure, causing the compressor to operate at higher capacity.

When fan switch is set at AUTO, the indoor-air fan cycles with the compressor. When the switch is set at CONT, the indoor-air fan runs continuously.

At shutdown, the Time Guard® II timer prevents the compressor from restarting for approximately 5 minutes.

When installed, a field-supplied solenoid valve (wired in parallel with the compressor contactor coil), shuts off the liquid line to prevent refrigerant migration back to the compressor during the off cycle.

**Heating** — The heating thermostat (TH) energizes a field-supplied relay which operates heating controls and energizes the indoor-fan relay. When the fan switch is set at AUTO, the indoor-air fan cycles with the heating control. The indoor-air fan runs continuously when the fan switch is set at CONT.

**Fan Cycling** — Head pressure control is accomplished by cycling the fans. The no. 2 fan responds to liquid line pressure, cycling on at approximately 257 psig (1772 kPa) and off at approximately 126 psig (869 kPa).

**Winter Start Control (If Installed)** — When the compressor starts, the control's bypass timer contacts close for 150 seconds, thereby bypassing the low-pressure switch during start-up. After 150 seconds, the bypass timer contacts open and the low-pressure switch is restored to the safety circuit.

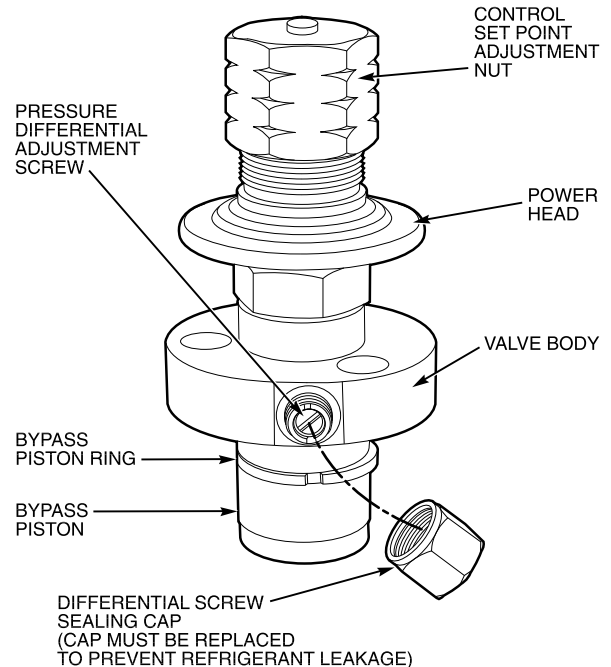
## SERVICE

**Capacity Control** — A suction pressure-actuated unloader controls 2 cylinders and provides capacity control. Unloaders are factory set (see Tables 1A-1D), but can be field adjusted as described in the 2 following sections.

**CONTROL SET POINT** (cylinder load point) is adjustable from 0 to 85 psig (586 kPa). To adjust, turn control set point adjustment nut (Fig. 12) clockwise to its bottom stop. In this position, set point is 85 psig (586 kPa). Next, turn adjustment counterclockwise to desired control set point. Every full turn counterclockwise decreases set point by 7.5 psig (51.7 kPa).

**PRESSURE DIFFERENTIAL** (difference between cylinder load and unload points) is adjustable from 6 to 22 psig (41.4 to 152 kPa). To adjust, turn pressure differential adjustment screw (Fig. 12) counterclockwise to its back stop position. In this position, differential is 6 psig (41.4 kPa). Next, turn adjustment clockwise to desired pressure differential setting. Every full turn clockwise increases differential by 1.5 psig (10.3 kPa).

**Head Pressure Control** — *Fan cycling* is a standard feature. The no. 2 fan cycles in response to changes in liquid pressure. The switch cycles the fan off at  $126 \pm 4$  psig ( $869 \pm 28$  kPa) as pressure decreases, and cycles it back on at 257 (+5, -0) psig (1772 [+103, -0] kPa).



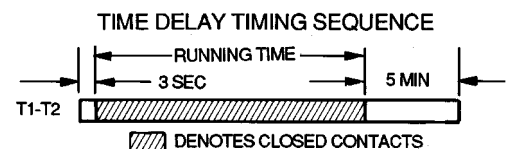
**Fig. 12 — Compressor Capacity Control Unloader**

**Time Guard II Circuit** — Prevents short-cycling by providing a delay of approximately 5 minutes before restarting compressor after shutdown from safety device action.

On start-up, the Time Guard II timer causes a delay of approximately 3 seconds after thermostat closes.

On compressor shutdown, the timer recycles for approximately 5 minutes. During this time, the compressor cannot restart.

Refer to Fig. 13 and to label diagram on unit.



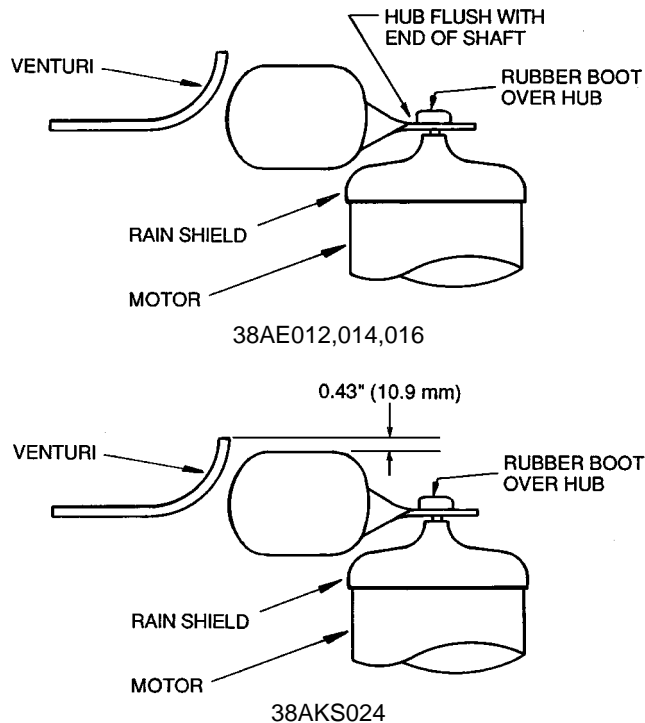
**Fig. 13 — Timer Sequence Chart**

**Winter-Start Control (If Required)** — Install Accessory Package 38AE900021.

**Crankcase Heater** — The heater prevents refrigerant migration and compressor oil dilution during shutdown whenever compressor is not operating. It is wired into the control circuit, and cycles with the compressor; the heater is off when compressor is running, and on when compressor is off.

Both compressor service valves must be closed whenever the crankcase heater is deenergized for more than 6 hours. The crankcase heater is operable as long as the control circuit is energized.

**Outdoor Fans** — Each fan is supported by a formed-wire mount bolted to the fan deck and covered with a wire guard. The exposed end of the motor shaft is covered with a rubber boot. In case a fan motor must be repaired or replaced, be sure the rubber boot is put back on when the fan is reinstalled and be sure the fan guard is in place before starting the unit. Figure 14 shows the proper position of the mounted fan. Fan motors have permanently lubricated bearings.



**Fig. 14 — Outdoor Fan**

## Lubrication

FAN MOTORS have sealed bearings. No provisions are made for lubrication.

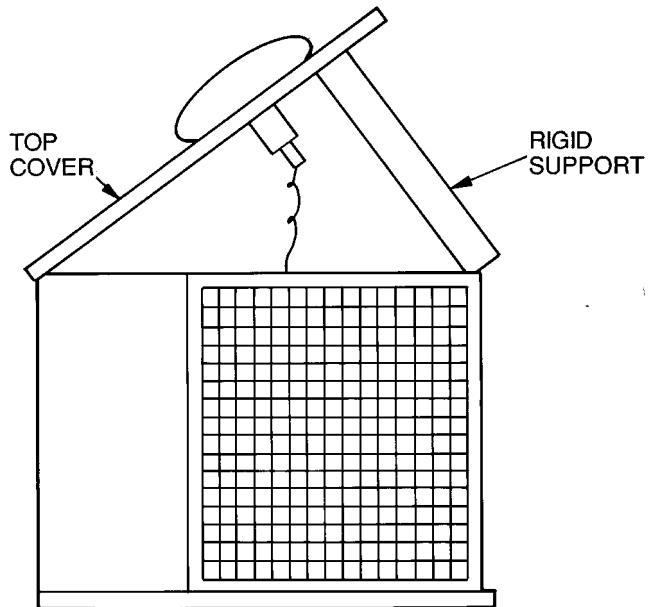
COMPRESSOR has its own oil supply. Loss of oil due to a leak in the system should be the only reason for adding oil after the system has been in operation. See Oil Charge section.

**Cleaning Coils** — The coils can be cleaned with a vacuum cleaner, washed out with water, blown out with low-pressure compressed air, or brushed (*do not use wire brush*). Fan motors are drip-proof but not waterproof.

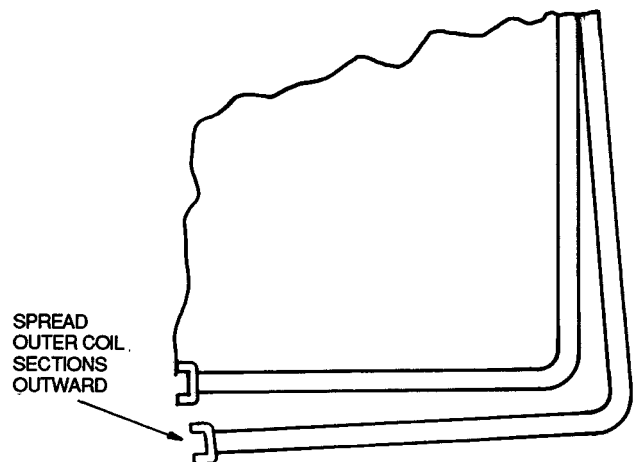
Clean outdoor coil annually or as required by location or outdoor air conditions. Inspect coil monthly, and clean as required. Fins are not continuous through coil sections; dirt and debris may pass through first section, become trapped between the 2 rows of fins (38AE012) or 3 rows of fins

(38AE014,016, 38AKS024) and restrict outdoor airflow. Use a flashlight to determine if dirt or debris has collected between coil sections. Clean coil as follows:

1. Turn off unit power.
2. Remove screws holding rear corner posts and top cover in place. Pivot top cover up 12 to 18 in. (305 to 457 mm) and support with a rigid support. See Fig. 15.
3. Remove clips securing tube sheets together at the return bend end of the coil. Carefully spread the ends of the coil rows apart by moving the outer sections. See Fig. 16.
4. Using a water hose, or other suitable equipment, flush down between the sections of coil to remove dirt and debris.
5. Clean the remaining surfaces in the normal manner.
6. Reposition outer coil sections.
7. Reinstall clips which secure tube sheets.
8. Replace top cover and rear corner posts.



**Fig. 15 — Pivot and Support Top Cover**



**Fig. 16 — Coil Cleaning (Typical)**

## TROUBLESHOOTING

PROBLEM	SOLUTION
<p><b>COMPRESSOR DOES NOT RUN</b></p> <p><u>Contactors Open</u></p> <ol style="list-style-type: none"> <li>1. Power off.</li> <li>2. Fuses blown in field power circuit.</li> <li>3. No control power.</li> <li>4. Thermostat circuit open.</li> <li>5. Time Guard® II device not operating.</li> <li>6. Compressor circuit breaker tripped.</li> <li>7. Safety device lock-out circuit active.</li> <li>8. Low-pressure switch open.</li> <li>9. High-pressure switch open.</li> <li>10. Compressor overtemperature switch open.</li> <li>11. Loose electrical connections.</li> <li>12. Compressor stuck.</li> </ol> <p><u>Contactors Closed</u></p> <ol style="list-style-type: none"> <li>1. Compressor leads loose.</li> <li>2. Motor windings open.</li> <li>3. Single phasing.</li> </ol>	<ol style="list-style-type: none"> <li>1. Restore power.</li> <li>2. After finding cause and correcting, replace with correct size fuse.</li> <li>3. Check secondary fuse(s); replace with correct type and size. Replace transformer if primary windings receiving power.</li> <li>4. Check thermostat setting.</li> <li>5. Check Time Guard II devices.</li> <li>6. Check for excessive compressor current draw. Reset breaker; replace if defective.</li> <li>7. Reset lock-out circuit at thermostat or circuit breaker.</li> <li>8. Check for refrigerant undercharge, obstruction of indoor airflow, or whether compressor suction shutoff valve is fully open. Make sure liquid line solenoid valve(s) is open.</li> <li>9. Check for refrigerant overcharge, obstruction of outdoor airflow, air in system, or whether compressor discharge valve is fully open. Be sure outdoor fans are operating correctly.</li> <li>10. Check for open condition. Allow for reset. Replace if defective.</li> <li>11. Tighten all connections.</li> <li>12. See compressor service literature.</li> <li>1. Check connections.</li> <li>2. See compressor service literature.</li> <li>3. Check for blown fuse. Check for loose connection at compressor terminal.</li> </ol>
<p><b>COMPRESSOR STOPS ON HIGH-PRESSURE SWITCH</b></p> <p><u>Outdoor Fan On</u></p> <ol style="list-style-type: none"> <li>1. High-pressure switch faulty.</li> <li>2. Reversed fan rotation.</li> <li>3. Airflow restricted.</li> <li>4. Air recirculating.</li> <li>5. Noncondensables in system.</li> <li>6. Refrigerant overcharge.</li> <li>7. Line voltage incorrect.</li> <li>8. Refrigerant system restrictions.</li> </ol> <p><u>Outdoor Fan Off</u></p> <ol style="list-style-type: none"> <li>1. Fan slips on shaft.</li> <li>2. Motor not running.</li> <li>3. Motor bearings stuck.</li> <li>4. Motor overload open.</li> <li>5. Motor burned out.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace switch.</li> <li>2. Confirm rotation, correct if necessary.</li> <li>3. Remove obstruction.</li> <li>4. Clear airflow area.</li> <li>5. Purge and recharge as required.</li> <li>6. Purge as required.</li> <li>7. Consult power company.</li> <li>8. Check or replace filter drier, expansion valve, etc. Check that compressor discharge service valve is fully open.</li> <li>1. Tighten fan hub setscrews.</li> <li>2. Check power and capacitor.</li> <li>3. Replace bearings.</li> <li>4. Check overload rating. Check for fan blade obstruction.</li> <li>5. Replace motor.</li> </ol>
<p><b>COMPRESSOR CYCLES ON LOW-PRESSURE SWITCH</b></p> <p><u>Indoor-Air Fan Running</u></p> <ol style="list-style-type: none"> <li>1. Compressor suction service valve partially closed.</li> <li>2. Liquid line solenoid valve(s) fails to open.</li> <li>3. Filter drier plugged.</li> <li>4. Expansion valve power head defective.</li> <li>5. Low refrigerant charge.</li> </ol>	<ol style="list-style-type: none"> <li>1. Open valve fully.</li> <li>2. Check liquid line solenoid valve(s) for proper operation. Replace if necessary.</li> <li>3. Replace filter drier.</li> <li>4. Replace power head.</li> <li>5. Add charge. Check low-pressure switch setting.</li> </ol>

## TROUBLESHOOTING (cont)

PROBLEM	SOLUTION
<p>COMPRESSOR CYCLES ON LOW-PRESSURE SWITCH (cont)</p> <p><u>Airflow Restricted</u></p> <ol style="list-style-type: none"> <li>1. Coil iced up.</li> <li>2. Coil dirty.</li> <li>3. Air filters dirty.</li> <li>4. Dampers closed.</li> </ol> <p><u>Indoor-Air Fan Stopped</u></p> <ol style="list-style-type: none"> <li>1. Electrical connections loose.</li> <li>2. Fan relay defective.</li> <li>3. Motor overload open.</li> <li>4. Motor defective.</li> <li>5. Fan belt broken or slipping.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check refrigerant charge.</li> <li>2. Clean coil fins.</li> <li>3. Clean or replace filters.</li> <li>4. Check damper operation and position.</li> <li>1. Tighten all connections.</li> <li>2. Replace relay.</li> <li>3. Power supply.</li> <li>4. Replace motor.</li> <li>5. Replace or tighten belt.</li> </ol>
<p>COMPRESSOR RUNNING BUT COOLING INSUFFICIENT</p> <p><u>Suction Pressure Low</u></p> <ol style="list-style-type: none"> <li>1. Refrigerant charge low.</li> <li>2. Head pressure low.</li> <li>3. Air filters dirty.</li> <li>4. Expansion valve power head defective.</li> <li>5. Indoor coil partially iced.</li> <li>6. Indoor airflow restricted.</li> </ol> <p><u>Suction Pressure High</u></p> <ol style="list-style-type: none"> <li>1. Unloaders not functioning.</li> <li>2. Compressor valve defective.</li> <li>3. Heat load excessive.</li> </ol>	<ol style="list-style-type: none"> <li>1. Add refrigerant.</li> <li>2. Check refrigerant charge. Check outdoor-air fan thermostat settings.</li> <li>3. Clean or replace filters.</li> <li>4. Replace power head.</li> <li>5. Check low-pressure setting.</li> <li>6. Remove obstruction.</li> <li>1. Check unloader adjustments. Check unloader setting.</li> <li>2. See compressor service literature.</li> <li>3. Check for open doors or windows in vicinity of fan coil.</li> </ol>
<p>UNIT OPERATES TOO LONG OR CONTINUOUSLY</p> <ol style="list-style-type: none"> <li>1. Low refrigerant charge.</li> <li>2. Control contacts fused.</li> <li>3. Air in system.</li> <li>4. Partially plugged expansion valve or filter drier.</li> </ol>	<ol style="list-style-type: none"> <li>1. Add refrigerant.</li> <li>2. Replace control.</li> <li>3. Purge and evacuate system.</li> <li>4. Clean or replace.</li> </ol>
<p>SYSTEM IS NOISY</p> <ol style="list-style-type: none"> <li>1. Piping vibration.</li> <li>2. Compressor noisy.</li> </ol>	<ol style="list-style-type: none"> <li>1. Support piping as required.</li> <li>2. Check valve plates for valve noise. Replace compressor if bearings are worn.</li> </ol>
<p>COMPRESSOR LOSES OIL</p> <ol style="list-style-type: none"> <li>1. Leak in system.</li> <li>2. Crankcase heaters not energized during shutdown.</li> <li>3. Improper interconnecting piping design.</li> </ol>	<ol style="list-style-type: none"> <li>1. Repair leak.</li> <li>2. Check wiring and relays. Check heater and replace if defective.</li> <li>3. Check piping for oil return. Replace if necessary.</li> </ol>
<p>FROSTED SUCTION LINE</p> <p>Expansion valve admitting excess refrigerant.</p>	<p>Adjust expansion valve.</p>
<p>HOT LIQUID LINE</p> <ol style="list-style-type: none"> <li>1. Shortage of refrigerant due to leak.</li> <li>2. Expansion valve opens too wide.</li> </ol>	<ol style="list-style-type: none"> <li>1. Repair leak and recharge.</li> <li>2. Adjust expansion valve.</li> </ol>
<p>FROSTED LIQUID LINE</p> <ol style="list-style-type: none"> <li>1. Restricted filter drier.</li> <li>2. Liquid line solenoid valve partially closed.</li> </ol>	<ol style="list-style-type: none"> <li>1. Remove restriction or replace.</li> <li>2. Replace valve.</li> </ol>
<p>COMPRESSOR WILL NOT UNLOAD</p> <ol style="list-style-type: none"> <li>1. Defective unloader.</li> <li>2. Defective capacity control solenoid valve (if used).</li> <li>3. Miswired capacity control liquid line solenoid (if used).</li> <li>4. Weak, broken, or wrong valve body spring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace unloader.</li> <li>2. Replace valve.</li> <li>3. Rewire correctly.</li> <li>4. Replace spring.</li> </ol>
<p>COMPRESSOR WILL NOT LOAD</p> <ol style="list-style-type: none"> <li>1. Miswired capacity control liquid line solenoid (if used).</li> <li>2. Defective capacity control solenoid valve (if used).</li> <li>3. Plugged strainer (high side).</li> <li>4. Stuck or damaged unloader piston or piston ring(s).</li> </ol>	<ol style="list-style-type: none"> <li>1. Rewire correctly.</li> <li>2. Replace valve.</li> <li>3. Clean or replace strainer.</li> <li>4. Clean or replace the necessary parts.</li> </ol>





## PACKAGED SERVICE TRAINING

Our packaged service training programs provide an excellent way to increase your knowledge of the equipment discussed in this manual. Product programs cover:

- Unit Familiarization
- Maintenance
- Installation Overview
- Operating Sequence

A large selection of product, theory, and skills programs is available. All programs include a video cassette and/or slides and a companion booklet. Use these for self teaching or to conduct full training sessions.

For a free Service Training Material Catalog (STM), call 1-800-962-9212. Ordering instructions are included.

# START-UP CHECKLIST

## A. Preliminary Information

OUTDOOR: MODEL NO. \_\_\_\_\_ SERIAL NO. \_\_\_\_\_  
INDOOR: AIR HANDLER MANUFACTURER \_\_\_\_\_  
MODEL NO. \_\_\_\_\_ SERIAL NO. \_\_\_\_\_  
ADDITIONAL ACCESSORIES \_\_\_\_\_

## B. Pre-Start-Up

### OUTDOOR UNIT

IS THERE ANY SHIPPING DAMAGE? \_\_\_\_\_ (Y/N) \_\_\_\_\_  
IF SO, WHERE: \_\_\_\_\_

WILL THIS DAMAGE PREVENT UNIT START-UP? (Y/N) \_\_\_\_\_  
CHECK POWER SUPPLY. DOES IT AGREE WITH UNIT? (Y/N) \_\_\_\_\_  
HAS THE GROUND WIRE BEEN CONNECTED? (Y/N) \_\_\_\_\_  
HAS THE CIRCUIT PROTECTION BEEN SIZED AND INSTALLED PROPERLY? (Y/N) \_\_\_\_\_  
ARE THE POWER WIRES TO THE UNIT SIZED AND INSTALLED PROPERLY? (Y/N) \_\_\_\_\_  
HAVE COMPRESSOR HOLDDOWN BOLTS BEEN LOOSENED (Snubber washers are snug, but not tight)?  
(Y/N) \_\_\_\_\_

### CONTROLS

ARE THERMOSTAT AND INDOOR FAN CONTROL WIRING  
CONNECTIONS MADE AND CHECKED? (Y/N) \_\_\_\_\_  
ARE ALL WIRING TERMINALS (including main power supply) TIGHT? (Y/N) \_\_\_\_\_  
HAS CRANKCASE HEATER BEEN ENERGIZED FOR 24 HOURS? (Y/N) \_\_\_\_\_

### INDOOR UNIT

HAS WATER BEEN PLACED IN DRAIN PAN TO CONFIRM PROPER DRAINAGE? (Y/N) \_\_\_\_\_  
ARE PROPER AIR FILTERS IN PLACE? (Y/N) \_\_\_\_\_  
HAVE FAN AND MOTOR PULLEYS BEEN CHECKED FOR PROPER ALIGNMENT? (Y/N) \_\_\_\_\_  
DO THE FAN BELTS HAVE PROPER TENSION? (Y/N) \_\_\_\_\_  
HAS CORRECT FAN ROTATION BEEN CONFIRMED? (Y/N) \_\_\_\_\_

### PIPING

ARE LIQUID LINE SOLENOID VALVES LOCATED AT THE EVAPORATOR COILS AS REQUIRED? (Y/N) \_\_\_\_\_  
HAVE LEAK CHECKS BEEN MADE AT COMPRESSOR, CONDENSER, EVAPORATOR(S),  
TXVs (Thermostatic Expansion Valves), SOLENOID VALVES, FILTER DRIERS, AND FUSIBLE PLUGS  
WITH A LEAK DETECTOR? (Y/N) \_\_\_\_\_  
LOCATE, REPAIR, AND REPORT ANY LEAKS. \_\_\_\_\_  
HAVE ALL COMPRESSOR SERVICE VALVES BEEN FULLY OPENED (BACKSEATED)? (Y/N) \_\_\_\_\_  
HAVE LIQUID LINE SERVICE VALVES BEEN OPENED? (Y/N) \_\_\_\_\_  
IS THE OIL LEVEL IN EACH COMPRESSOR CRANKCASE VISIBLE IN THE COMPRESSOR SIGHT GLASSES?  
(Y/N) \_\_\_\_\_

### CHECK VOLTAGE IMBALANCE

LINE-TO-LINE VOLTS: AB \_\_\_\_\_ V AC \_\_\_\_\_ V BC \_\_\_\_\_ V  
(AB + AC + BC)/3 = AVERAGE VOLTAGE = \_\_\_\_\_ V  
MAXIMUM DEVIATION FROM AVERAGE VOLTAGE = \_\_\_\_\_ V  
VOLTAGE IMBALANCE = 100 X (MAX DEVIATION)/(AVERAGE VOLTAGE) = \_\_\_\_\_ %  
IF OVER 2% VOLTAGE IMBALANCE, DO NOT ATTEMPT TO START SYSTEM!  
CALL LOCAL POWER COMPANY FOR ASSISTANCE.

CUT ALONG DOTTED LINE

### C. Start-Up

CHECK EVAPORATOR FAN SPEED AND RECORD. \_\_\_\_\_

CHECK CONDENSER FAN SPEED AND RECORD. \_\_\_\_\_

AFTER AT LEAST 10 MINUTES RUNNING TIME, RECORD THE FOLLOWING MEASUREMENTS:

OIL PRESSURE	
SUCTION PRESSURE	
SUCTION LINE TEMP	
DISCHARGE PRESSURE	
DISCHARGE LINE TEMP	
ENTERING CONDENSER AIR TEMP	
LEAVING CONDENSER AIR TEMP	
EVAP ENTERING-AIR DB (dry bulb) TEMP	
EVAP ENTERING AIR WB (wet bulb) TEMP	
EVAP LEAVING AIR DB TEMP	
EVAP LEAVING AIR WB TEMP	

COMPRESSOR AMPS (L1/L2/L3) \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

CHECK THE COMPRESSOR OIL LEVEL SIGHT GLASSES; ARE THE SIGHT GLASSES SHOWING OIL LEVEL IN VIEW? (Y/N)

NOTES:

[illegible]